

Prowler: Best For The Future?

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SUBJECT AREA Aviation

#### EXECUTIVE SUMMARY

TITLE: PROWLER: BEST FOR THE FUTURE?

**PURPOSE.** Although the goal of an all-STOVL ACE by 2010 is worthwhile in terms of maneuverability and flexibility, none of the possible candidate STOVL platforms are capable of executing airborne mission-support electronic warfare as we know it today. If the Marine Corps is to retain the capability to win on future battlefields, it must continue to command the electromagnetic spectrum.

**PROBLEM.** The new MAGTF Master Plan states that the Marine Corps will possess an all-STOVL force by 2010. The EA-6B is incompatible with that goal, because it is a single-mission airplane with unique support requirements, and so Marine EA-6Bs will be returned to the Navy when other aircraft pods/pallets are fielded to conduct the EW mission. If the Marine Corps returns its EA-6Bs to the Navy, it will give up more than just an airframe--the airborne support EW mission will be severely degraded.

**DATA.** The electronic threat environment is growing more and more lethal, especially in the Third World, and the battlefield is growing more electronically dependent. The EA-6B and TERPES are both evolving to cope with this more dangerous threat. The combination of EA-6Bs and TERPES gives the MAGTF commander the advantage in situational awareness, while denying that awareness to the enemy. Helicopters, the KC-130, the F/A-18D, Unmanned Aerial Vehicles (UAVs), and the Medium Lift Replacement (MLR) all offer advantages to the MAGTF, but they all fall short in some aspect of EW capability. Weight-bearing capacity, electrical power generation, airspeeds, and altitudes all contribute to the ability to conduct airborne EW.

**CONCLUSIONS.** When the factors of threat, mission needs, and current and projected platform capabilities are weighed, the ability to have men in the loop to make tactical decisions is of paramount importance. Subsumed in that ability is a platform designed to keep those men involved in decisionmaking. The more EW systems are miniaturized and automated, the less they are capable of responding to an increasingly sophisticated threat environment. The Marine Corps cannot afford to replace the EA-6B before 2010, and it may not be prepared to do so then.

**RECOMMENDATIONS.** Before giving up the EA-6B in favor of an all-STOVL force, Marine Corps planners must determine the full ramifications of that loss on MAGTF survivability. Long-garnered EW expertise and mission flexibility cannot be rebuilt quickly. Planners should be very careful before irrevocably committing the Marine Corps to a marginally survivable force, even if that force is extremely mobile and deployable.

PROWLER: BEST FOR THE FUTURE?

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## OUTLINE

THESIS: Before Marines discard or degrade the ability to conduct airborne, manned electronic warfare (EW), they must carefully consider the real, long-term value of airborne support EW to the MAGTF.

### I. MAGTF Master Plan EW Goals

- A. All-STOVL Force
- B. EW Divided: MLR, F/A-18, UAV
- C. EA-6B Incompatible with Goal

### II. Current Strengths

- A. TERPES/TEAMS
- B. Cadre of Experts
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### III. What's Ahead?

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- C. F/A-18D
- D. UAVs/RPVs
- E. MV-22/MLR

### V. Whats Really Important?

- A. Support EW Mission Primary
- B. Platform Secondary
- C. Continued Effectiveness in the Face of Change

## PROWLER: BEST FOR THE FUTURE?

This is an exciting time to be a Marine, especially a Marine aviator. With peace breaking out all over the world, the Department of Defense (DOD) budget is shrinking dramatically. National budget deficits and social problems, especially the illegal drug crisis, demand that an even greater share of budgetary attention be paid to domestic issues. Yet, with the inexorable drawdown of forces, we have the rare opportunity to take a hard look at the possible future missions of the Marine Corps and shape our fighting force accordingly. Now is the time to sharpen our much-touted Marine Air Ground Task Force (MAGTF) concept through precisely tailored air and ground acquisition, training, and doctrine. Indeed, when has there ever been a better time than now to complete the transition of air power from a mere supporting arm to a fully integrated combined arm in the MAGTF?

Marines train to exploit fleeting opportunities. In our zeal to trim the Marine Corps budget, we may be all too eager to prematurely throw away certain programs or capabilities because of their apparently high cost-benefit ratio. Much has been written recently about the economic need to reduce the types of aircraft in the MAGTF, for some very good reasons. One of those reasons is that for required flexibility in the future, each weapons system will have to rapidly shift among multiple missions. Single-mission aircraft are not perceived to be flexible enough to respond to the fluid battlefield most analysts have predicted. Another good reason to reduce aircraft types in the MAGTF is to simplify aviation logistics requirements. Operating fewer types of aircraft translates to streamlined aviation maintenance and supply, and it gives the MAGTF commander greater flexibility in task organizing his air. The Marine Corps Aviation Neckdown Plan is shown in Figure 1.1

## MAGTF MASTER PLAN EW GOALS

The Marine Corps plans to achieve an all-STOVL (Short Takeoff Vertical Landing) force by 2010. Before Marines discard or degrade the ability to conduct airborne, manned electronic warfare (EW), though, they must carefully consider the real, long-term value of airborne

support EW to the MAGTF.

An all-STOVL force will give the MAGTF commander the flexibility and maneuverability he will require in 2010. The quicker the Marine Corps achieves this flexibility, the more effective it will be as the exemplar of maneuver warfare...or will it? Toward this end, Marine planners are already replacing the A-6E with the F/A-18D--shouldn't they follow suit with the EA-6B Prowler? Isn't the Prowler an expensive anachronism in today's "Maneuver Corps"? To answer these questions, we must first examine the benefit to the MAGTF of airborne support EW as it is practiced today. Then we should look at the evolutionary changes to the threat and to the EA-6B. Finally, we must consider the requirement for an orderly transition to the all-STOVL force in light of distant future mission requirements.

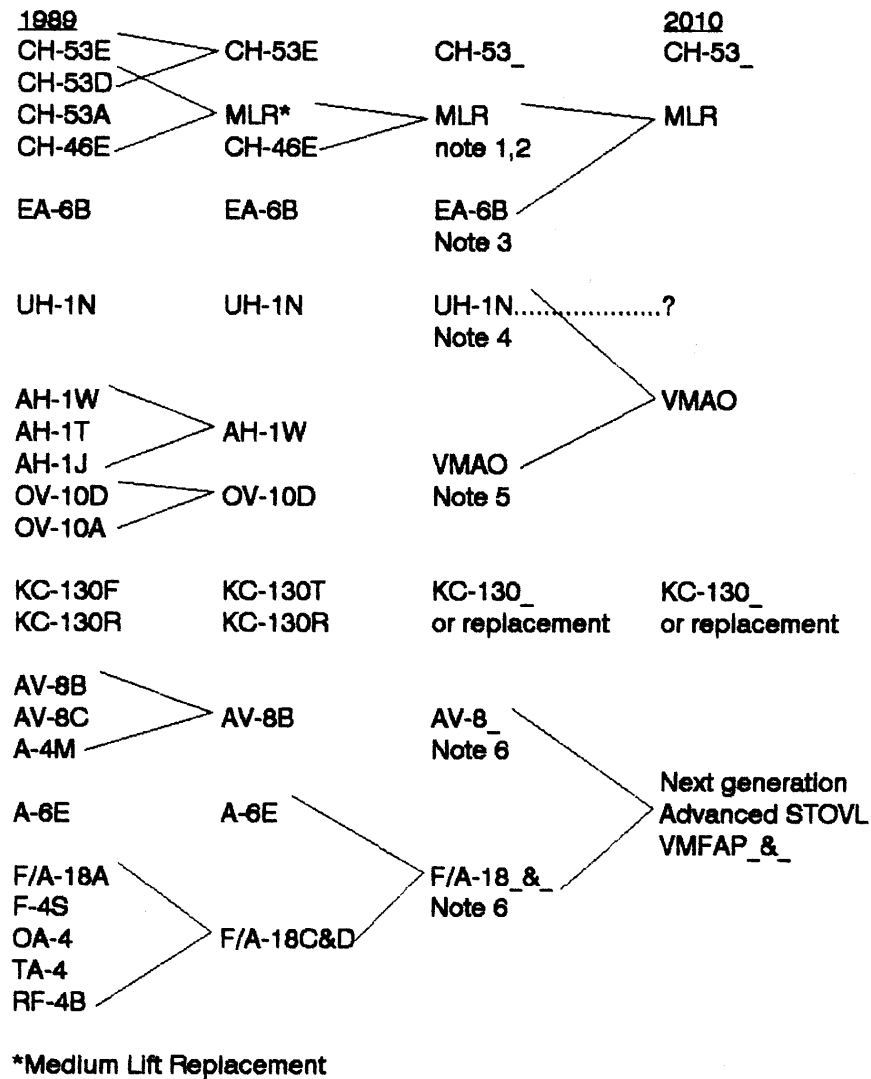
#### EA-6B Limitations

There are some good arguments that support the position that the Marine Corps should remove the EA-6B from the inventory. It's a single-mission (EW) aircraft. It is relatively large and heavy, as far as jet aircraft go. It can't even hope to attain a STOVL capability.

The Prowler could become a millstone around the MAGTF's neck because of its unique supply and maintenance requirements, although there is a great deal of commonality between

1 U.S. Marine Corps. MAGTF Warfighting Center. MAGTF Master Plan, July 7, 1989, pp. P-1, ES-3.

**Figure 1: USMC AVIATION NECKDOWN PLAN<sup>2</sup>**



**Notes**

1. Develop pallet kits to support airborne: (a) electronic warfare; (b) C2; (c) DASC; (d) refueler; and/or (e) clandestine pathfinder.
2. When technology available, develop an Airborne Early Warning variant.
3. Return to USN when other A/C (pallet/pods) can assume mission.
4. Delete when VMAO or other utility A/C can support utility mission.
5. A new VTOL aircraft to assume AH-1 and OV-10 missions and for escort mission have a positive speed differential of 1.2 to 1.5 over the MLR.
6. Either or both include pods to conduct portions of aerial reconnaissance and electronic warfare.

the current EA-6B and the AV-8B and F/A-18 in avionics.

One of the main arguments for phasing the Prowler out of the inventory is its expense. The EA-6B ICAP-II (Improved Capability-2nd Version) flies with state-of-the-art technology, and that technology is costly. A current estimate of the fly-away cost of an ICAP-II aircraft is \$26 million.<sup>3</sup> The Navy and Marine Corps are planning to remanufacture ICAP-II aircraft into the Advanced Capability (ADVCAP) upgrade, beginning in FY92, for \$25 million each.<sup>4</sup> The cost estimate for new ADVCAP aircraft is \$38 million each.<sup>4,5</sup>

The EA-6B was designed to work against portions of an enemy's Integrated Air Defense System (IADS), and its weapons system has evolved to match the increasingly sophisticated IADS of the Soviet Union and the Warsaw Pact. Now that the nation's attention is being redirected to the Third World, many planners do not see a need to continue maintaining and modernizing an expensive weapon system designed against a threat we are unlikely to face. They believe that the third-world low-intensity air defense threat would hardly challenge our sophisticated tactical fighters and attack aircraft, let alone a platform as capable as the EA-6B. If the Marine Corps is paring down its forces to be able to efficiently fight in low-intensity and special operations arenas, these planners believe that the Prowler and other high-tech support systems will have to be cut from the inventory.

#### CURRENT STRENGTHS

The EA-6B offers the Marine Corps several combat advantages. The resident EW expertise in VMAQ-2 (active duty, flying EA-6Bs) and VMAQ-4 (reserve, flying EA-6As) is invaluable to MAGTF and other Marine Corps planners. Those experts are able to integrate

<sup>3</sup> Recurring cost, without jamming pods, at 12 aircraft per year, in FY89 dollars.

<sup>4</sup> Recurring cost, without jamming pods, at 12 aircraft per year, in FY90 dollars.

5 Schmidt, Nolan, LtCol, USMC, Chief of Naval Operations (CNO/OP-501E). Personal interview concerning EA-6B cost data, The Pentagon, March 24, 1990.

an electronic picture of the battlefield, to advise commanders concerning the most advantageous use of radar and communications jamming, and to assist other aircrews in selecting the most survivable ingress and egress routes. VMAQ-2 and VMAQ-4 personnel are experienced in evaluating the electronic battlefield, developing strike routes that exploit enemy vulnerabilities, and creating gaps where only surfaces appear.

#### TERPES/TEAMS

The most direct benefit that a Marine EA-6A/B detachment brings to the MAGTF is its ability to help the commander see the battlefield. Through the Tactical Electronic Reconnaissance Processing and Evaluation System (TERPES) and the Tactical EA-6B Mission Planning System (TEAMS), EA-6A/B Electronic Warfare Support Measures (ESM) missions update the commander's Electronic Order of Battle (EOB). These updates give the Air Combat Element (ACE) commander the timely information he needs to plan deep and close air support, integrated with the suppression of enemy air defenses. Within half an hour after an EA-6A/B ESM mission has landed, a TERPES report highlights critical threats to the MAGTF, especially those that have moved or changed their electronic parameters. Within two hours of landing, another TERPES report details all the threats in the MAGTF's area of interest. TERPES also updates national EOBs through the Navy operational reporting system.

TERPES is unique to the Marine Corps. When the Marines first became involved in EW, they realized that they would need a substantial ESM capability. The Navy did not have as great a need as the Marine Corps--they had other ESM platforms like the EA-3 and the EP-3 aircraft. The Navy's primary purpose for acquiring the Prowler was as a jamming platform in power projection and war-at-sea roles. The Marine Corps, on the other hand, placed equal weight on ESM and Electronic Countermeasures (ECM) (jamming), and independently developed TERPES. The EA-6B operates with a digital tape recorder, which can



record everything the electronic "eyes" of the airplane see and everything the crew does with the jammers. This digitally recorded information is essential to determine threat emitter locations from triangulation, and to template the battlefield. The TEAMS workstation reads the tapes, and then TERPES combines these mission tapes with historical EOBs and near-real-time information from other sources to paint an up-to-the-minute picture of the electronic battlefield.

TERPES has proven itself often in combat and in exercises. TERPES analysts were first to report Soviet-built SA-3 missile sites in two Third-World communist countries, and they contributed significantly to mission planning for the Operation Eldorado Canyon strikes on Libya while aboard USS America. TERPES reports helped the Joint Electronic Warfare Center conduct its evaluation of jamming during that operation.

When Marines are tasked to provide EA-6B detachments to aircraft carriers for a cruise, they take TERPES along. Initially, disgruntled commanders of carrier air groups (CAGs) usually complain about the space required to set up TERPES equipment inside the Carrier Intelligence Center, but by the end of the cruise the CAGs can't praise TERPES enough. They invariably request TERPES if the need for Marine Prowlers arises again.

The EA-6B cannot operate without the TEAMS workstation. They were designed as an integrated weapon system. TEAMS can also assist other ACE and Navy aircrews with intelligence support for route selection. TEAMS plots threat radar acquisition ranges and surface-to-air missile (SAM) and anti-aircraft artillery lethal ranges, and can draw optimum friendly flight paths through the threats. EA-6B aircrews can then select radars along the flight paths as targets for jamming or High-Speed Antiradiation Missiles (HARMs) and all aircrews can begin detailed flight planning.

#### Cadre of Experts

Conduct of War. After considering the advantages of TERPES, let's look at the value

of having a manned airborne support EW platform. Designed to work mainly against early warning/ground-controlled intercept and acquisition radars, the EA-6B can also be effective against target trackers, missile beacons, and fire control radars. The real value of the platform, though, is in having men in the loop to make tactical decisions. The Prowler is manned by a pilot (left front seat) and three Electronic Countermeasures Officers (ECMOs). The ECMO in the front right seat handles most of the navigation and communication, and communications jamming when the aircraft is so equipped. The two ECMOs in the rear cockpit continually track and analyze the radar threat, prioritize jammer assignments to suppress enemy air defenses, and keep friendly forces informed concerning critical battlefield developments. The EA-6B crew's goal is to take the "I" out of "IADS".

By having men in a close interface with the EA-6B system, critical, unexpected threat changes can be quickly assessed, reported, and countered. Typically, deep air strikes are designed as combined-arms coordinated attacks with integrated EA-6B jamming support. The entire strike package is usually airborne at the same time, and routes are planned based on preflight intelligence. An enemy mobile SAM battery could move to protect a key air avenue of approach and simultaneously change its operating frequencies after the strike package is airborne, presenting a formidable obstacle to the strike's mission accomplishment. Without an EA-6B, the strikers might not detect the changes until it was too late. However, the back-seat ECMOs could notice the changes, advise the strike aircrews, and redesign their own jammer assignments to cover them.

The analysis of enemy IADS surfaces and gaps and the creation of fog and friction for the enemy are the ECMO's stocks in trade. From their first EW school and throughout their careers, ECMOs not only learn about enemy weapon systems' operating characteristics, detection ranges, and lethal ranges, they study engagement sequences and critical weaknesses. They practice exploiting these critical command and control vulnerabilities in order to buy time and space for friendly forces to make sound decisions, maintain sufficient maneuver room, and accomplish their missions. This EW expertise is critical to the ACE, and by extension to the MAGTF, in order to effectively execute maneuver warfare.

Planning for War. Marine ECMOs not only serve as EW specialists in the conduct of war in the tactical squadrons, they fill critical advisory planning billets in each Marine Expeditionary Force (MEF) and throughout DOD. They do not merely look out for Marine interests; they provide the expertise to ensure the success of sister-Service and joint forces. The Marine Prowler community supplies an electronic warfare officer (EWO) to each MEF and Marine Aircraft Wing. Key EW requirements and acquisition billets, with cognizance over all Navy and Marine Corps aircraft, are filled by Marines. In fact, both of the Program Managers for all Navy helicopter EW systems and all Army helicopter EW systems are Marines. Marine EWOs serve in key positions in the Joint Staff, the Naval Space Command, the US Space Command, and the Joint Electronic Warfare Center. Sister-Service and joint commanders recognize the value of the aggressive winning spirit Marine EWOs bring with them, and they know that this spirit, combined with the creative application of EW, will be essential to winning on future battlefields.

EW is one of the six functions of Marine Aviation. As success in war becomes more and more dependent on command of the electromagnetic spectrum, the criticality of EW becomes paramount. The more effectively we conduct EW in the future, the more success we will enjoy. The EW function is not conducted only by mission-support platforms like the EA-6B; self-protection EW systems are already part of every aircraft we fly. Whether the Prowler remains in the inventory is immaterial compared to the importance of the support EW mission. Like it or not, Marine aviators will practice EW more in the future than today, because the nature of future war is electronic. The resource of EW experts we have amassed over the years must be tapped if we plan to win on future battlefields.

## WHAT'S AHEAD?

### Threat Changes

Most intelligence analysts agree that the sophistication and lethality of today's battlefield will be surpassed in the near future, and the threat sector that will experience the most pronounced modernization will be the Third World.

The Soviet Union has recently transferred advanced MiG-29 fighter aircraft and SA-5 surface-to-air missiles (SAMs) to North Korea. Libya trains terrorists on its soil while providing support to subversive, opposition, and terrorist groups worldwide. The diffusion of power and advanced weaponry...is posing new dangers, and this trend will likely continue in the future. Countries hostile to the United States will almost certainly acquire more lethal weapon systems. This...may support limited, ambiguous provocations that we must be prepared to counter. The damage wrought by low-intensity conflict could become extremely great.<sup>6</sup>

Of course, this increased threat sophistication also applies to mid-intensity and high-intensity conflict. "A key consideration in modern general war is the levelling effect widespread proliferation of technology will continue to have among the world's forces. Operations by even the most effective air forces will face great risk from widely available air defense weapons, for example."<sup>7</sup> The Israeli Air Force discovered the cost of underestimating Third-World air defenses in the October 1973 war.

<sup>6</sup> Carlucci, Frank C., Secretary of Defense. Annual Report to the Congress, January 17, 1989, pp. 11-13.

<sup>7</sup> Ibid., pp. 5-7.

#### EA-6B/TERPES Evolution

In the face of increasingly lethal IADS, especially in the Third World, the requirement for a dedicated, airborne EW platform will not diminish. It will increase. The EA-6B's latest upgrade, the ADVCAP (Advanced Capability), is designed to enable it to meet the near-term threat. With an Initial Operating Capability (IOC) during 1994, it will have a totally redesigned, extremely fast and capable receiver system, a greatly expanded frequency range, and an integrated communications/low-frequency radar jammer. It will be able to carry two additional HARM missiles or jamming pods and to exploit alternate threat cues in order to provide commanders a quicker and more accurate assessment of the battlefield.

TERPES is also evolving to meet the threat. It will soon have a datalink to Marine EA-6Bs and will be interoperable with the new DOD Intelligence Information System and other national, Navy, and Marine intelligence data bases. These and other upgrades will enable it to provide MAGTF and ACE commanders real-time and near-real-time updated electronic battlefield "maps".<sup>8</sup>

Without these improvements, the Prowler/TERPES team would fall behind the needs of the MAGTF. With them, the MAGTF can maintain the initiative on the battlefield, maximizing friendly situational awareness and minimizing that of the enemy.

#### ALTERNATE PLATFORMS

Several platforms have been considered to take up some portion of the support EW mission. Unless the roles and expectations of airborne EW are changed, these platforms will not be able to execute support EW as we know it today. Let's briefly examine several of these platforms' advantages and limitations in the support EW mission area.

5 Flowers, Anthony, CWO-2. Marine Corps Research, Development, and Acquisition Command (MCRDAC)/SIGINT-EW, personal interview concerning TERPES, Quantico, March 19, 1990.

#### HELICOPTERS

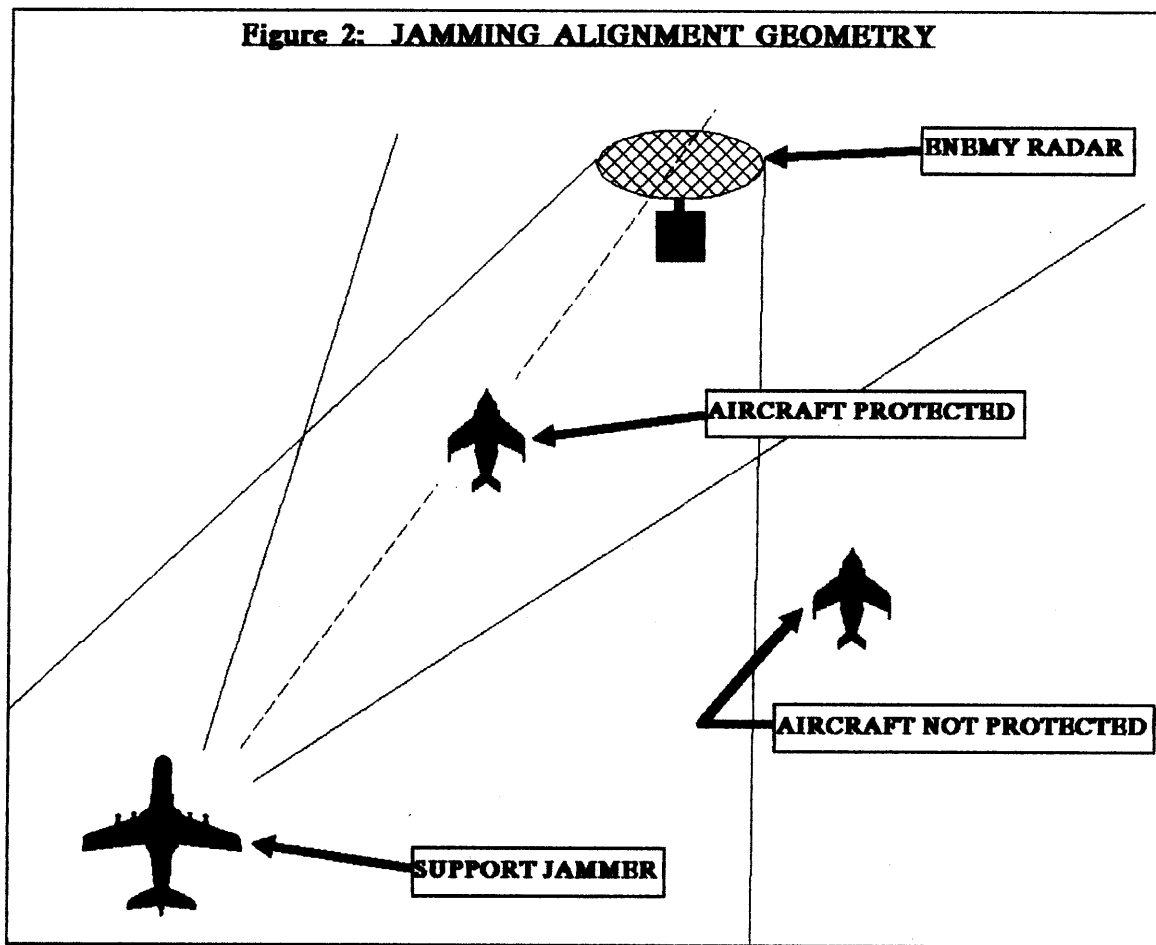
The Army has been very successful with its communications-jamming helicopter, QUICKFIX, but it has not yet fielded an airborne radar jammer. However, it is investigating the application of the EA-6B's AN/ALQ-99 system to the UH-1H platform in its Airborne Radar Jammer (ARJ) program. The advantages of an ARJ would be improved responsiveness to ground and other helicopter forces and good protection of helicopters against radar-guided SAMs. Because of altitude and speed differences, a heliborne radar jammer would not offer adequate protection to fixed-wing jets because of jamming geometry considerations. To give the best protection, a jammer needs to align itself with protected aircraft and victim radar(s). (See Figure 2.) A helicopter obviously could not achieve and

maintain enough geometric alignment to adequately protect jets.

The EA-6B ADVCAP will be an outstanding electronic reconnaissance platform, on the order of an EP-3 in quality.<sup>9</sup> At 35,000 feet, for example, its line-of-sight range will permit it to see deep into the enemy's back yard, providing the MAGTF commander a very thorough EOB update. A helicopter's line-of-sight range is much more constrained because of its lower operating altitudes. Also, at the slower airspeeds of a helicopter, it would take much longer to accumulate distinct lines of bearing to an enemy emitter sufficient to triangulate and locate it

Additionally, most helicopters do not have the weight-bearing or power generation capability to operate current radar jammers. The EA-6B's internal on-board system, the AN/ALQ-99, weighs approximately 1500 pounds, and the ADVCAP upgrade will increase that weight by at least 1500 pounds more. EA-6B jamming pods weigh around 1000 pounds apiece, and they each require 30 kilowatts (KVA) of electrical power. To keep from having to draw from main aircraft power, the pods use small Ram Air Turbines (RATs) to generate their own electricity. The current EA-6B can carry up to 5 pods, each of which carries two

<sup>9</sup> Schmidt, op cit, March 24, 1990.



jamming transmitters. In order to turn the RATs fast enough to generate 30 KVA, 192 Kts airspeed is required for one transmitter; 220 Kts for both.<sup>10</sup> If helicopters were to protect a fixed-wing attack force, they would need to carry multiple pods, or many helicopters would be required. Also, a helicopter would probably have to carry an Auxiliary Power Unit (APU) to generate enough electricity for the system. The combination of low airspeed, limited weight-bearing capacity, and electrical power considerations detracts from most helicopters' effectiveness as support jamming platforms. Of course, larger helicopters such as the CH-46, CH-53, and UH-60 would have much less of a problem with weight. They should be able to

<sup>10</sup> U.S. Navy. EA-6B NATOPS Flight Manual, NAVAIR 01-85ADC-1, w/Change 3, June 1, 1987, p. 1-15

carry the internal system, several jamming transmitters, and an APU, but they would still have geometry and altitude problems associated with protecting jets.

#### KC-130

Another platform under consideration for an airborne support EW mission is the venerable KC-130. This possibility has several advantages, such as more than adequate weight and power capability and sufficient operating altitude and endurance to support tactical jets. Also, the KC-130 makes an outstanding intercept platform, and it can self-deploy. However, its relatively slow speed would make maintaining adequate geometric alignment to protect jets difficult. An EW version of the KC-130 could readily protect helicopter and AV-8 assets in relatively small Amphibious Operating Areas and areas where enemy air defenses were limited.

#### F/A-18D

One of the missions being considered for the multi-mission F/A-18D program is support EW. Advantages of this platform are that it is a jet and the Marine platform would be common with the Navy. In addition, the F/A-18D is nearly 100% common with other F/A-18s, simplifying the MAGTF's supply and maintenance burden. However, the F/A-18 is already severely weight and space limited, and over-automation could severely limit the responsiveness and effectiveness of the F/A-18D's EW support on a battlefield where the unexpected is commonplace.

For technical reasons such as receiver sensitivity and dynamic range, the internal ADVCAP avionics system will weigh in excess of 3000 pounds, without any jammers. The state of the art has not yet advanced to be able to install that kind of capability in a platform as small as the F/A-18. Without that kind of capability, the F/A-18D EW suite will be little more than a self-protection radar warning receiver.

The reason that automation will degrade the F/A's EW capability is the same reason that



it degraded the EF-111's capability. The Air Force realized the need for an airborne support EW platform soon after the Navy and Marine Corps did, but Air Force requirements were slightly different than those of the Navy. The Air Force felt that they needed a jammer with long enough legs and sufficient airspeed to escort supersonic bombers in and out of a target area. Of the available technology, the EA-6B's AN/ALQ-99 system most closely met Air Force requirements, but some functions had to be automated to fit the system into the F-111 platform. This automation was required for two reasons: the ALQ-99E (Air Force version) system would be operated by only one crewman; and at the higher airspeeds projected for Air Force missions, events would transpire too quickly for a manual system to cope. In addition, the Air Force deleted the highest frequencies from the ALQ-99E's jammers, which further lightened the load on the lone system operator. The result of all these changes is that many critical decisions and actions are preprogrammed in the EF-111, rendering it less responsive to unexpected threat changes than the EA-6B. The F/A-18 will not only be forced to accept a greater degree of automation than the EA-6B, the EW module will only be one of several mission modules to be flown by the aircraft. With this platform, Marine Corps expectations for responsive airborne EW support will have to be lowered.

#### UAVs/RPVs

Unmanned Aerial Vehicles (UAVs)/Remotely Piloted Vehicles (RPVs) are the most promising platforms on the horizon to conduct support EW missions, but our concept of EW will have to make a significant change in order to most effectively use them. Col Karch's article (MCG, February 1990) includes an excellent illustration of a concept of operations for EW for Suppression of Enemy Air Defenses (SEAD) by UAVs. ECM expendables, decoys, communications jammers, and lethal anti-radiation weapons are all well suited to UAV missions. An enemy IADS could literally be saturated with mini-jammers and loitering antiradiation missiles, which would linger over his radars and communications sites for hours, and then attack when those sites attempted to radiate.<sup>11</sup>

However, the miniaturization needed for a flexible, responsive UAV EW system is

presently beyond today's state of the art, and some automation would be required. With automation would come some of the same limitations as listed for other small platforms. Col Karch stated some of the disadvantages of attempting to add EW payloads to UAVs.

First, it adds complexity; therefore, the more capable and complex the electronics package, the higher the procurement cost. Second, multiple false target generation requires greater electrical power, and UAVs do not have large excess power capabilities. Multiple threat radars compound the first two problems...There is also the problem of locating enemy air defense units precisely for timely suppression. Stand-off EW jamming and air-launched ARMs are certainly needed...[but] EW aircraft...may not be available due to limited Marine Corps inventories and a stated desire to convert to an all STOVL force.<sup>12</sup>

#### MV-22/MLR

The MV-22 would be a viable platform for a Marine Corps modular support EW system, but it has been canceled by the Secretary of Defense. In the MAGTF Master Plan, the MAGTF Warfighting Center has changed all reference to "MV-22" to "MLR," or Medium Lift Replacement. The need for a replacement for the CH-46 hasn't gone away, and tilt-rotor technology may still be available for the Marine Corps. Therefore, the MLR should be included when considering possible support EW platforms.

If the MLR is indeed a tilt-rotor aircraft, then it would have the advantages of sufficient

<sup>11</sup> Karch, Lawrence G., Col, USMC. "CAS, SEAD, and UAVs," Marine Corps Gazette, Volume 74, Number 2, February 1990, p. 44ff.

<sup>12</sup> Ibid., pp 49, 52.

speed, weight capacity, and power generation to adequately support jets. A jamming aircraft would not have to attain the same speeds as protected jets (~420-560 Kts) in order to generate effective jamming signals-nor would jamming transmitters draw from internal aircraft electric power. Having a slower speed than jets would make this job more difficult than for an EA-6B because of the requirement for geometric alignment, but it could be done.

As a support EW platform, the MLR's disadvantages are the time required for

developing a new airframe and an EW module for it, the cost involved in a new development, and the degradation to the EW mission caused by being part of a multi-mission platform.

New aircraft take a long time to develop and acquire. Typically, the time from concept development to IOC is about 10 years. If we were to start today, we would probably not field a new aircraft before the turn of the century. It is also an expensive proposition. It is not likely that the American people would stand for another (post B-2 and F-117) new aircraft start in the middle of the current budget crisis. In any case, reduced spending levels would probably drag out the purchase and fielding of the plane until 2005 or 2010.

The main reason we need an MLR is stated in its middle name, lift, not EW. Again, the EW mission module will necessarily be an adjunct. Because it won't be a dedicated support EW platform, its EW capabilities will be more limited than the current EA-6B.

EW platform capabilities are compared in Appendix A.

#### WHAT'S REALLY IMPORTANT?

The Marine Corps has only recently officially realized that certainty cannot be achieved in war, but EW system requirements have been written to provide ever-more certainty. "The very nature of war makes absolute certainty impossible; all actions in war will be based on incomplete, inaccurate, or even contradictory information."<sup>13</sup> The drive for certainty has led to more and more automation in both EW and intelligence collection systems. In an attempt to cope with the fast-changing threat environment, developers have built more automated functions and decisions into intelligence and EW systems. This automation has resulted in the opposite of its intent--the more automated systems are less capable of coping with rapid threat changes than the more manual ones. The EA-6B is designed with an optimum combination of automation and manual functions; the on-board system rapidly sorts through and displays the myriad bits of electronic information from the battlefield, but the more critical decisions and evaluations are left to the men. Both elements, men and machine, are essential to the most intelligent application of airborne EW as a combined arm in the MAGTF.

If the Marine Corps abandons the EA-6B platform in favor of smaller, less capable,

more automated systems, it will abandon the mission, too. No proposed replacement platform can perform ESM and EOB updates as effectively as the current ECMO/EA-6B/TERPES combination, nor can any proposed replacement provide as effective jamming protection as the Prowler. Before changing the mission, Marines must weigh the benefits of current airborne support EW against the desire for an all-STOVL force.

The requirement for a responsive, flexible support EW system will only increase in the near term, and it will grow astronomically in the distant future. The Marine Corps can not afford to replace the Prowler before 2010, and it may not be prepared to do so then. The MAGTF Master Plan states that by 2010, the EA-6B will be returned to the Navy "when other aircraft (pallet/pods) can assume the mission," but with the intensifying threat, the Navy will have an even greater need for the Prowler for protection of the fleet Marine EW support will have to be provided primarily by Marines.

13 U.S. Marine Corps. MAGTF Warfighting Center. Warfighting, FMFM-1, Quantico, March 6, 1989, p. 6.

The world is changing. The threat is changing; roles are changing; national interests and goals are changing--the Marine Corps must evolve to continue to protect those interests. Some of the changes are needed: the adoption of maneuver warfare; the fielding of an available, combat-ready expeditionary force; the renewed interest in professional military education. However, not everything Marines have done in the past has been bad. One of the things Marines have traditionally been especially good at is airborne electronic warfare. Marines are taught to be careful not to try to "fix what ain't broke." Now is the time to teach them how to use what we have, not to throw away one of our greatest strengths.

## Appendix A: BW PLATFORM CAPABILITIES<sup>1</sup>

	EA-6B	Helicopter	KC-130	F/A-18	UAV	MLR
<b>Flexible Processing</b>						
<b>ESM Recorder</b>						
<b>Men in Loop<sup>2</sup></b>					3	
<b>Protect Jets (Geometry)</b>					4	
<b>Protect Helos</b>						
<b>ECM Speed to power jammers</b>					5	
<b>Space/Weight Capacity</b>						
<b>Men in Loop<sup>2</sup></b>					3	

Full Capability
  Partial Capability
  Marginal Capability

**Notes:**

1. Capability assessments for conceptual platforms or those still under development are those than can be reasonably expected.
2. Most critical category in modern, fluid battlefield.
3. Possible within datalink line of sight only.
4. Midrange UAV (jet-powered) may be fully capable.
5. Could power very low power jammer only. However, many low-cost systems could saturate the battlefield.

## Appendix B: GLOSSARY

A/C.....	Aircraft	KVA.....	kilowatts (thousands of volt-amps)
ACE .....	Aviation Combat Element	MAGTF.....	Marine Air Ground Task Force
ADVCAP.....	Advanced Capability (EA-6B)	MLR.....	Medium Lift Replacement
ARJ .....	Airborne Radar Jammer (USA)	RAT .....	Ram Air Turbine
CAG.....	Commander, Air Group (USN)	RPV.....	Remotely Piloted Vehicle
DOD.....	Department of Defense	SAM.....	Surface-to-Air Missile
ECM.....	Electronic Countermeasures	SEAD.....	Suppression of Enemy Air Defenses
ECMO .....	Electronic Countermeasures Officer	STOVL .....	Short Takeoff/Vertical Landing
EOB.....	Electronic Order of Battle	TEAMS .....	Tactical EA-6B Mission Planning System
ESM .....	Electronic Warfare Support Measures	TERPES .....	Tactical Electronic Reconnaissance Processing and Evaluation System
EW.....	Electronic Warfare	UAV .....	Unmanned Aerial Vehicle
EWO .....	Electronic Warfare Officer	USN.....	United States Navy
HARM.....	High-speed Anti-Radiation Missile	VMAO.....	Marine Attack/Observation Squadron
IADS .....	Integrated Air Defense System	VMAQ.....	Marine Tactical Electronic Warfare Squadron
ICAP-II .....	Improved Capability-II (EA-6B)		
IOC.....	Initial Operating Capability		
Kts.....	knots		

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